reply that the latest type of electrostatic separator is the Blake-Morscher, which was described in a paper read before the Institution of Mining and Metallurgy by E. A. Weinberg (Transactions, 1905, vol. xiv., p. 169). It is of American manufacture, and can probably be obtained from Fraser and Chalmers, of Erith. Earlier forms are exhaustively described in a paper read by H. C. McNeill before the Iron and Steel Institute (Journal, 1899, vol. lvi., p. 18). Machinery for the extraction of iron pyrites is made by the German "Humboldt Company," of Kalk, near Cologne.

THE *Verhandlungen der deutschen physikalischen Gesellschaft* for December, 1907, contains a communication from Prof. E. Wiedemann, in which he directs attention to two Arabic books of the thirteenth and fourteenth centuries, in the former of which the method of magnetising a steel needle by rubbing it on a natural lodestone is described, while in the latter instructions are given for mounting a needle so magnetised within a wooden fish, which when placed on water heads always to the north. This appears to be the first known mention of the compass, although the matter is treated as if it were common knowledge at the time.

VOL. iv. of "Contributions from the Jefferson Physical Laboratory of Harvard University" contains thirteen memoirs, five of which are from the pen of Prof. B. O. Peirce. Most of these memoirs are reprinted from vol. xlii. of the Proceedings of the American Academy of Arts and Sciences, 1906. There is one, on architectural acoustics, by Prof. W. C. Sabine, reprinted from the *American Architect* for 1900, which well deserves close attention from architects in this country. It is a thoroughly scientific attack on the problem of determining the acoustical properties of a room before it is built. The author describes his measurements of the absorbing powers of walls, screens, furniture, and audience, and shows how the constants thus determined can be used in calculating the amount of reverberation to be expected in a large number of cases. In each case direct measurement confirmed the result of the calculation.

THE report for 1908 of the International Committee on Atomic Weights is printed in No. 335 of the Proceedings of the Chemical Society. From the data here given, and from those cited in previous reports, it is concluded that the entire table of atomic weights is in need of revision. The values assigned to potassium and sodium are too high; those given to chlorine and sulphur are too low, and these constants affect the determination of many others. They depend, however, on the atomic weight of silver, which is probably, but not certainly, as low as 107·88. It is well known that work upon these fundamental constants is now nearing completion in several laboratories, and within a few months it should be possible to enter upon a satisfactory revision of the table, a task which would be unsatisfactory if undertaken now. It is true that the present table contains inconsistencies, but they are small in amount, and are due to inconsistencies in the original data from which the values are derived. Since issuing the last report Prof. Moissan has died, and has been succeeded on the committee by M. G. Urbain. The report being drawn up in November last does not deal with the striking result obtained by W. Marckwald in the case of tellurium, which has been published since; this element has long held an abnormal position in the periodic arrangement owing to its appearing to have an atomic weight greater than that of iodine. According to Marckwald, its correct atomic weight is 126·85, that is, 0·12 unit less than the atomic weight of iodine, so that it now falls into line with the rest of the elements.

A SECOND edition of Mr. Arthur Whiting's "Retouching" has been published by Messrs. Dawbarn and Ward, Ltd.

A SECOND edition of the useful "Handbook to the Vivaria and Fresh-water Aquaria" at the Horniman Museum, Forest Hill, S.E., has been issued by the London County Council. Copies may be obtained through a bookseller, or directly from Messrs. P. S. King and Son, of Westminster; the price of the catalogue is one penny.

MESSRS. CROSBY LOCKWOOD AND SON have published a fifth edition of Dr. Bernard Dyer's "Fertilisers and Feeding Stuffs: their Properties and Uses," which contains also the full text of the Fertilisers and Feeding Stuffs Act, 1906, the regulations and forms of the Board of Agriculture, and notes on the Act by Mr. A. J. David. The new edition has been revised, and its price is 1*s.* net.

OUR ASTRONOMICAL COLUMN.

THE RECENT SPECTRUM AND MAGNITUDE OF NOVA PERSEI No. 2.—The results of Prof. Hartmann's more recent investigations of the spectrum of Nova Persei No. 2 (1901) appear in No. 4232 of the *Astronomische Nachrichten* (p. 113, February 8). Finding that when the magnitude of the star became less than 10·0 he was unable to photograph the spectrum with the large instrument used in the previous investigation, Prof. Hartmann devised a new spectroscope in which the collimator objective, of 40 mm. aperture and 60 cm. focal length, was made of U.V. glass, and the camera objective was made of quartz, having an aperture of 40 mm. and a focal length of 32 cm.; quartz prisms were employed, and the distance between Hβ and Hδ on the plate was 4·6 mm. This spectrograph was used in conjunction with the 80-cm. refractor, and a good spectrum was obtained with 8¼ hours' exposure on October 15 and 18, 1907, when the Nova's magnitude was 11·4. The main feature of this spectrum is its similarity to the spectrum of the Wolf-Rayet star B.D. 35°.4001. In both spectra the brightest line is at λ 4688, whilst Hβ, Hγ, and Hδ are more faintly shown. The fairly strong line in the spectrum of the W.-R. star at λ 4618 is comparatively faint in that of the Nova, whilst the trace of a line in the latter at λ 3890 is not to be found in the Wolf-Rayet spectrum. The chief nebula lines at λλ 5007 and 4959 are apparently absent from both spectra or are very faint.

Determinations of the magnitude of the Nova gave the following results:—1905, November 1, 11·2; 1906, November 24, 11·3; and 1907, October 13, 11·44.

THE HELIUM LINE, D_3, AS A DARK LINE IN THE SOLAR SPECTRUM.—In No. 393 of the *Observatory* (p. 94, February) Mr. A. A. Buss discusses the article by Father Cortie, which appeared in the January number, anent the presence of the dark, D_3, line of helium in the solar spectrum. From our previous note (No. 1995, p. 281, January 23) it will be remembered that Father Cortie discussed a photograph obtained by Mr. Nagaraja, on which both the dark and the bright line of helium, D_3, were supposed to be represented, and came to the conclusion that the identification was, possibly, a mistaken one. Mr. Buss now advances a number of arguments upholding the original view. In the first place, he points out that any arguments on this question suffer considerable uncertainty owing to different values being given for the principal lines under discussion. Thus Runge and Paschen give 5875·870 as the wave-length of the laboratory emission line, whilst in Young's revised list the wave-length of the chromospheric line is given as 5876; that the latter, compared with the laboratory line, suffers displacement towards the red is indicated by several different observations. Mr. Nagaraja's dark line lies almost exactly mid-way between the two, at λ 5875·930, therefore Mr. Buss considers that

it is, probably, the helium line. Other evidence and his own observations of the dark D_3 line in active areas outside the umbral regions of spots support this view.

A DETAILED STUDY OF THE PHOTOSPHERE.—In No. 1895 of NATURE (vol. lxxiii., p. 401, February 22, 1906) we published an article dealing with Prof. Hansky's study of the size and movements of the granules comprising the solar photospheric surface. Mr. Chevalier, of the Zô-sé Observatory, China, has for some time been engaged on a similar study, and publishes some very interesting results, with photographs, in No. 1, vol. xxvii., of the *Astrophysical Journal* (January, p. 12). The principal conclusions deduced from the results show that on comparing photographs taken at one minute or half-minute intervals the same photospheric granules may be easily recognised, although their shapes and brilliancies undergo considerable changes. A more detailed comparison shows changes in their relative positions, the magnitude of the changes differing greatly both in direction and velocity. The velocities obtained range from 0 to 30 or more kilometres per second, and, in the mean, are much lower than those obtained by Prof. Hansky.

SECTIONAL ADDRESSES AT THE CHICAGO MEETING OF THE AMERICAN ASSOCIATION.

BY the courtesy of Dr. L. O. Howard, permanent secretary of the American Association for the Advancement of Science, we have been favoured with copies of several addresses delivered by chairmen of sections of the association at the recent Chicago meeting, of which an account was given in NATURE of January 30. Subjoined are summaries of some of the points of interest in these addresses. A summary of the president's address appeared in NATURE of January 23.

Music and Melody.

In his address to Section B (physics) Prof. W. C. Sabine chose as his topic "Melody and the Origin of the Musical Scale," the discourse being a critique of views published fifty-five years ago by Helmholtz in his "Tonempfindungen." It is pointed out that in part ii. of that work Helmholtz gave a physical and physiological explanation of the harmony and discord of *simultaneous* sounds, and Prof. Sabine briefly quotes Helmholtz's description of the structure of the human ear, so far as it is required to explain why overlapping tones produce a sense of discord, thus leading to the necessity of a musical scale with regular intervals for the building up of harmonies. But in applying this principle to account for the origin of such a scale, Helmholtz was met by an apparent anachronism.

Up to the eleventh or twelfth century only homophonic music existed, this consisting merely in the progression of single-part melody. The existing music of the Oriental and Asiatic races belongs to this type, and Helmholtz, admitting that between sounds which reach the ear in discrete succession there could be neither harmony nor discord, nor beats, sought another explanation for the fact that musical scales were existent long before the introduction of polyphonic and harmonic music. Prof. Sabine now offers a new explanation of this particular point. When sounds are produced inside a closed space such as a building, they continue to reverberate for a certain interval after the exciting source has ceased to exist. In this connection Prof. Sabine gives (without, however, specifying the units) a list of the absorbing powers of different substances. It follows that as soon as melodies were performed inside buildings such as temples of worship, the consecutive notes became blended, and this overlapping produced all the conditions necessary for the production of the harmonies and discords discussed by Helmholtz in explanation of the chordal use of the musical scale. This proposed theory of Prof. Sabine's would (so it is claimed) account for the absence of a musical scale among the native tribes of Africa.

The Problem of Heredity.

It is a sign of the times that the addresses delivered before the American Association by Dr. D. T. Macdougal, a botanist, and by Dr. E. G. Conklin, a zoologist, are not about botany and zoology respectively, but that both deal with heredity; and it is evidence of the vastness of the topic with which they deal that, though they both treat of the mechanism of heredity, their two addresses do not overlap. Both addresses are admirable examples of what such addresses should be. Their opening sentences exhibit a breadth of view which, if we may say so, has not been a distinguishing feature of a great deal of recent American biological literature; and both addresses contain such a wealth of references to, and accounts of, new observations and experiments which bear on the interpretation of fundamental problems that the earnest biologist will do well to read them both.

Dr. Macdougal opens his address on "Heredity and Environic Forces" with some well-needed remarks on the assumption that the changes which ensue when a plant is transported to a violently different environment—as, for example, when a mesophyte is grown as a xerophyte—are adaptive changes. According to Dr. MacDougal, these are not only assumptions, but unwarrantable ones. Certain of the changes which accompany the transportation do undoubtedly benefit the plant in its new surroundings, "but results of the opposite character are encountered. Thus in my experiments with Roripa, the American watercress, it was seen to bear filiform, dissected leaves when submerged, linear dissected leaves when emersed, but when acclimatised at the Desert Laboratory developed broadly ovate, almost entire laminæ." Similarly etiolation, usually regarded as an adaptive change which enables the plant to lift its head above objects which keep the light from it, was found to occur in less than half the species tested, the majority "showing thickened organs and other useless alterations." Lastly, he cites the proof given by Lloyd that the movements of stomata are *not* adaptive or regulatory with respect to transpiration. We can heartily endorse Dr. Macdougal's conclusion on this part of his subject (as he happily phrases it in his native tongue), "that the entire matter of causal adaptations is in need of a basal re-investigation from an entirely new view-point."

But the most interesting part of this address is that which deals with the author's successful attempts to modify permanently the germ-plasms of plants by subjecting them to the influence of various chemicals. "It was found that the injection of various solutions into ovaries of Raimannia was followed by the production of seeds bearing qualities not exhibited by the parent, wholly irreversible, and fully transmissible in successive generations. One of the seeds produced by a plant of *Oenothera biennis* which had been treated with zinc sulphate differed so widely from the parental form that it could be distinguished from it by a novice. This new form "has been tested to the third generation, transmits all its characteristics fully, and does not readily hybridise with the parent even when grown so closely in contact with it that the branches interlock." Results as remarkable as this need confirmation, and it is to be hoped that similar experiments will shortly be undertaken in this country.

In his address on "The Mechanism of Heredity," Dr. E. G. Conklin suggests an answer to the question which always puzzles the philosophical biologist, "What exactly is the problem of heredity? How does it differ from that of development?" Dr. Conklin's answer is what at first sight would seem to be the natural and logical consequence of the acceptance of Weismann's doctrine of the continuity of the germ-plasm; it is, in fact, that there is little difference between the two problems. "Indeed, Heredity is not a peculiar or unique principle; for it is only similarity of growth and differentiation in successive generations. . . . In fact, the whole process of development is one of growth and differentiation, and similarity of these in parents and offspring constitutes hereditary likeness. The causes of heredity are thus reduced to the causes of the successive differentiations of development, and the *mechanism of heredity is merely the mechanism of differentiation.*" Having reduced the problem of heredity to this, Dr. Conklin goes on to consider the evidence for the view that the chromosomes are solely concerned in the process of differentiation, and expresses himself as definitely opposed to that view. He is not